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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/778,009	SCHER ET AL.	
	Examiner	Art Unit	
	Thanh-Truc Trinh	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *104-140 and 194-210* is/are pending in the application.

4a) Of the above claim(s) *194-210* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *104-140* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 104-140 in the reply filed on 8/23/2007 is acknowledged.

Since Applicant has elected Group I, claims 104-140, claims 194-210 are withdrawn from consideration.

The requirement is deemed proper and is therefore made FINAL.

Priority

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

The disclosure of the prior-filed application, Application Nos. 10/656802, 60/452038, 60/421353 fail to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application.

Applications Nos. 10/656802, 60/452038, 60/421353 do not contain subject matter such as "controlled partial oxidation of the polymer", and limitations described in claims 139-140.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 104-115, 118-119, 121-126 and 137 are rejected under 35 U.S.C. 102(b) as being anticipated by Salafsky (US Patent 6239355).

Regarding claim 104, as seen in Figures 1-3, Salafsky discloses a photovoltaic device comprising a first electrode layer (104); a second electrode layer (108); and a first photoactive layer (106) disposed between the first and second electrode layers, wherein the photoactive layer is disposed in at least partial electrical contact with the first electrode and with the second electrode (See Figure 2), and the photoactive layer comprises a first population of nanostructures (204) and a conductive polymer (202) whose charge carrying properties have been altered by controlled partial oxidation of the polymer. Salafsky teaches the polymer is used to conduct holes (See col. 3 lines 55-63) and as in the process of conducting holes, the polymer inherently loses its electrons to the holes. Therefore it is the Examiner's position that charge carrying properties have been altered by controlled partial oxidation of the polymer.

Regarding claim 105, Salafsky describes the polymer layer 202 absorbs light and convert to excitons which diffuse to a nanocrystal interface. At the interface, the excitons become dissociated and electrons are transferred to the nanoparticles leaving

holes behind for the polymer to transfer to the other electrode (See col. 4 lines 9-31). Therefore it is the Examiner's position that the nanostructures (204) and the oxidized conductive polymer (202) exhibit a type II band offset energy profile.

Regarding claims 106-108 and 111, since the reference to Salafsky meets the requirements of a choice in claim 104, it is also deemed anticipatory for claims 106-108 and 111 as claims 106-108 and 111 only limit to the other choice of claim 104.

Regarding claim 109, as seen in Figure 2, Salafsky discloses the nanostructures (204) are disposed in a matrix comprising the oxidized conductive polymer (202).

Regarding claim 110, as seen in Figure 2, Salafsky discloses the photoactive layer comprises at least two sublayers, wherein one sublayer comprises the nanostructures (204) and the other sublayer comprises the polymer (202).

Regarding claim 112, Salafsky describes the holes are transported through the polymer (202) to the electrode (104). (See col. 4 lines 28-31). Therefore it is the Examiner's position that the polymer is conductive polymer.

Regarding claims 113 and 115, Salafsky describes the nanostructures comprise single nanocrystal. (See Abstract or col. 4 line 23)

Regarding claim 118, as seen in Figure 2, Salafsky describes the photoactive layer (106) is disposed in at least partial electrical contact with the first electrode (104) along a first plane and with the second electrode (108) along a second plane.

Regarding claim 119, as seen in Figure 2, Salafsky describes the nanostructures (204) of the first population each has at least one elongated section oriented predominantly normal to at least the first plane.

Regarding claims 121-122, as seen in Figure 3, Salafsky discloses a hole blocking layer (301) disposed between the photoactive layer (106) and the first electrode (104), an electron blocking layer (302) disposed between the photoactive layer (106) and the second electrode (108). (See col. 35-56)

Regarding claims 123-124, Salafsky describes the electrodes and the photoactive layers are flexible. (See claim 11).

Regarding claim 125, Salafsky describes at least one of the first and second electrodes comprises a transparent conductive layer. (See col. 6 lines 26-31)

Regarding claim 126, Salafsky describes at least one of the electrodes comprises aluminum. (See col. 6 lines 26-31).

Regarding claim 127, as seen in Figure 1, Salafsky describes the electrodes (104 and 108) covering the top and bottom layers of photoactive layer (106). Therefore it is the Examiner's position that the photoactive layer (106) is hermetically sealed by electrodes 104 and 108.

Regarding claim 128, Salafsky describes substrate 102 covering the first electrode 104. Therefore it is the Examiner's position that the device of Salafsky comprises at least one sealing layer (102) in addition to the first and second electrodes.

Regarding claims 130-131, Salafsky describes the device can be curvi-linear or mechanically flexible. Therefore it is the Examiner's position that the overall device comprises a non-linear architecture, or a convex architecture.

Regarding claim 137, as seen in Figure 3, Salafsky discloses a second photoactive layer (308). (See col. 5 line 57 to col. 6 line 4).

Regarding claim 138, as seen in Figure 3, Salafsky discloses a third electrode layer (306 and 307); a fourth electrode layer (310 and 312); a second photoactive layer (308) disposed between the third and fourth electrode layers, wherein the second photoactive layer is disposed in at least partial electrical contact with the third electrode along a third plane and in at least partial electrical contact with the fourth electrode along a fourth plane. The second photoactive layer comprises a second population of nanostructures having a different absorption spectrum from the first population of nanostrucrtures (See col. 5 line 57 to col. 6 line 4), and wherein the third and fourth electrodes and second photoactive layer are attached to, but electrically insulated by isolation layer 304 from the first electrode, second electrode and first photoactive layer. (See col. 5 line 26 to col. 6 line 4).

2. Claims 104-113, 115-119, 121-129 are rejected under 35 U.S.C. 102(e) as being anticipated by Sager et al. (US Patent 6239355).

Regarding claim 104, Sager et al. disclose a photovoltaic device comprising a first electrode layer (110); a second electrode layer (106) and a first photoactive layer

(101) disposed between the first and second electrode layers, wherein the photoactive layer comprises a first population of nanostructures (107) and a conductive polymer (109) whose charge carrying properties have been altered by controlled partial oxidation of the polymer and a small molecule (111). Sager et al. teach layer 109 can be polymers such as poly(3-hexylthiophene-2,5,-diyl), (See col. 10 lines 1-25), which is a hole-transporting polymer. As in the process of conducting holes, the polymer inherently loses its electrons to the holes. Therefore it is the Examiner's position that charge carrying properties of the polymer have been altered by controlled partial oxidation of the polymer.

Regarding claim 105, Sager et al. described the conductive polymer (109) is a charge transfer material and an organic material that absorbs light. (See col. 9 line 66 to col. 10 line 32). Sager et al. also describe the small molecule (111) is in the form of differential charge transfer and differential light absorption (See col. 10 lines 33-58). Therefore it is the Examiner's position that the conductive polymer and the the small molecule exhibit a type II band offset energy profile.

Regarding claim 106, Sager et al. describe the small molecule comprises a semiconductor, organic, nonpolymer molecule. (See col. 10 line 33 to col. 12 line 41)

Regarding claim 107, Sager et al. describe the small molecule such as fullerene (C_{60}), which has a molecular weight less than 3000.

Regarding claim 108, Sager et al. describe the small molecule such as fullerene (C60) can be doped with charge-transfer salts include Na, K, Rb, Cs, Ca, Sr, B. (See

col. 10 line 59 to col. 11 line 20). Therefore, it is the Examiner's position that the small molecule (C60) when doped with Na, K, Rb, Cs, Ca, Sr and B conducts holes.

Regarding claim 109, as seen in Figures 1A and 1C, Sager et al. describe the nanostructures (107) are disposed in a matrix comprising the oxidized conductive polymer (109) or the small molecule (111).

Regarding claim 110, as seen in Figures 1A and 1C, Sager et al. describe the photoactive layer comprises at least two sublayers (107 and 109), wherein at least one of the sublayers comprises the nanostructures (107) and at least one of the sublayers comprises the oxidized conductive polymer or the small molecule (109). (See col. 9 line 36 to col. 10 line 32)

Regarding claim 111, as seen in Figures 1A and 1C, Sager et al. describe the photoactive layer (101) comprises the small molecule (111) disperse in a polymer (109).

Regarding claim 112, Sager et al. describe the polymer (109) is a conductive polymer. (See col. 9 line 66 to col. 10 line 32)

Regarding claim 113, Sager et al. describe the nanostructures comprise nanocrystals. (See col. 7 lines 26-32, col. 15 line 22 to col. 16 line 40)

Regarding claim 115, Sager et al. describe the nanostructures (107 or 307) comprises a single-crystal nanostructure, a double-crystal nanostructure, or a polycrystalline nanostructure. (See col. 9 lines 42-58)

Regarding claims 116-117, Sager et al. teach the nanostructures comprise at least a portion that is comprised of a semiconductor selected from Group II-VI semiconductor such as CdS, CdTe, CdSe. (See col. 9 lines 43-58)

Regarding claim 118, as seen in Figures 1-3, Sager et al. describe the photoactive layer (101) is disposed in at least partial electrical contact with the first electrode (110) along a first plane (as in the case template 105 extending all the way to the electrode 110 – See col. 8 lines 25-28) and with the second electrode (106) along the second plane (as layer 104 is optionally disposed between the photoactive layer 101 and the second electrode – See col. 7 lines 34-40)

Regarding claim 119, Sager et al. describe the nanostructures (or first charge transfer material 107) of the first population each has at least one elongated section oriented predominantly normal to at least the first plane. (See col. 15 line 66-col. 16 line 7)

Regarding claim 121, Sager et al. describe an electron blocking layer (104) disposed between the photoactive layer (101) and the second electrode (106). (See col. 7 line 64 to col. 8 line 6)

Regarding claim 122, Sager et al. describe a hole blocking layer (108) disposed between the photoactive layer (101) and the first electrode (110) and an electron blocking layer (104) disposed between the photoactive layer (101) and the second electrode (106). Sager et al. describe layer (108) of metal attaching to electrode 110

(See Figure 1A and col. 8 line 20-25). Therefore it is the Examiner's position that layer 108 conducts electrons and can function as a hole blocking layer.

Regarding claims 123-124, Sager et al. describe the photovoltaic cells are subjected to roll-to-roll process (See col. 7 lines 26-32). Therefore it is the Examiner's position that the first and second and the photoactive layers are flexible.

Regarding claim 125, Sager et al. describe the second electrode (106) comprises a transparent conductive layer. (See col. 7 lines 34-63)

Regarding claim 126, Sager et al. describe the first electrode (110) comprises aluminum. (See col. 7 lines 41-63)

Regarding claims 127-129, Sager et al. describe depositing the first electrode (110) on a substrate such as glass or plastic substrate (See col. 7 lines 55-63). Sager et al. also describe encapsulating the final device. (See col. 13 lines 25-48). Therefore it is the Examiner's position that the photovoltaic layer is hermetically sealed; at least one sealing layer (glass substrate) is included in addition to the first and second electrodes; the device comprises a second sealing layer (encapsulating layer); and the photoactive layer, first and second electrodes are sandwiched between the first and second sealing layers.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 114, 116-117 and 120 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salafsky (US Patent 6239355) in view of Alivisatos et al. (PGPub 20030226498).

Salafsky teaches a photovoltaic device as described in claim 104.

Salafsky does not specifically teaches the nanostructures comprise nanowires, at least a portion comprises a semiconductor selected from the group consisting of a Group II-VI semiconductor, a Group III-V semiconductor, a Group IV semiconductor; nor do they teach branched nanocrystals having more than one elongated segment.

With respect to claim 114, Alivisatos et al. teach nanostructures comprises nanorods of any length, or nanowires. (See paragraph 0061)

With respect to claim 116-117, Alivisatos et al. teach the nanostructures comprise a Group II-VI semiconductor such as ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe,

HgTe, a Group III-V semiconductors such as GaAs, GaP, GaAs, GaSb, InAs, InP, InSb, AlAs, AlSb, and a Group VI semiconductors such as Ge or Si. (See paragraph 0065).

With respect to claim 120, Alivisatos et al. also teach the nanostructures comprise branched nanocrystal having more than one elongated segment. (See paragraphs 0061-0064)

It would have been obvious to one skilled in the art at the time the invention was made to modify the device of Salafsky by using nanostructures as taught by Alivisatos et al., because it would improve efficiency. (See paragraph 0073)

4. Claim 129 is rejected under 35 U.S.C. 103(a) as being unpatentable over Salafsky (US Patent 6239355) in view of Simmons et al. (PGPub 20030226498).

Salafsky teaches a photovoltaic device as described in claim 128.

Salafsky does not specifically teach the second sealing layer, wherein the photovoltaic layer and first and second electrodes are sandwiched between the first and second sealing layers.

Simmons teaches using sealing layers 38 and 40, wherein the photovoltaic layer 20 and electrodes 34 and 36 are sandwiched between the sealing layers 38 and 40.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Salafsky by including a sealing layer as

taught by Simmon, because it would cover the electrodes and photoactive layer from external elements. (See col. 8 lines 21-26).

5. Claims 132-133 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salafsky (US Patent 6239355).

Salafsky teaches a photovoltaic device as described in claim 104.

Salafsky does not specifically teach the photoactive layer and the electrodes are oriented in a coiled architecture, or in a reciprocating stacked architecture. However, Salafsky teaches the electrodes and substrates of the device can be curvi-linear or mechanically flexible to be suitable for building applications among others (See col. 6 lines 41-46). Salafsky also teaches the photoactive material layer are in the range of nanometers, wherein the semiconductor particles have an average diameter about few nanometers to hundreds of nanometers (See col. 4 lines 54-63) and the and conjugated polymer has a thickness in the range of one to two times the average diameter of the nanoparticles. (See col. 2 lines 46-53). It is the Examiner's position that the device are flexible and bendable since the substrate, electrodes are flexible and the photoactive material layer is thin enough to be flexible. Therefore, it would have been obvious to one skilled in the art to have the device of Salafsky in coiled architecture. Salafsky also teach the layers electrodes and photoactive material layers can stacked up as seen in Figure 3. Therefore it certainly would have been obvious to one having ordinary skill in the art to have the device of Salafsky in reciprocating stacked architectrure.

6. Claims 134-136 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salafsky (US Patent 6239355) in view of Simmons (US Patent 5720827).

Salafsky teaches a photovoltaic device as described in claim 104.

Salafsky does not specifically teach the first population of nanostructures comprising at least two different nanocrystal subpopulations, wherein each nanocrystal subpopulation has different absorption spectrum; different nanocrystal subpopulation comprises different compositions; different nanocrystal subpopulations comprises nanocrystals having different size distribution.

With respect to claims 134-136, as seen in Figure 2, Simmons teaches a nanostructure population (or photoactive region 20) comprises at least two different nanocrystal subpopulations (22, 26, 28, 30, 32), wherein the subpopulations have different size and each subpopulation has different absorption spectrum. (See col. 5 lines 45-65 and col. 7 line to col. 8 line 15)

With respect to claim 135, as seen in Figure 5, Simmons teaches a nanostructure population (or photoactive region 20) comprises at least two different nanocrystal subpopulation (20A and 20B), wherein each subpopulation comprises different compositions, or different material. (See col. 13 lines 13-50)

It would have been obvious to one skilled in the art at the time the invention was made to modify the device of Salafsky by including at least two different nanocrystal

subpopulations with different size, composition and absorption spectrum as taught by Simmons, because it would give a photoactive layer that can efficiently absorb the entire range of incident optical radiation. (See col. 8 lines 14-16)

7. Claims 139-140 are rejected under 35 U.S.C. 103(a) as being unpatentable over Salafsky (US Patent 6239355) in view of Ono (PGPub 20030013008).

Salafsky discloses a photovoltaic device as described in claim 104.

Salafsky does not specifically teach a third electrode layer and a second photoactive layer disposed between the second and third electrodes layers, wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode. Nor does he teach a second photoactive layer, and a first recombination material disposed between the first and second photoactive layers, wherein the first recombination material is in at least partial electrical contact with the first and second photoactive layers.

As seen in Figure 21(d), Ono describes a composite light-receiving device comprising a first and second photoactive layers (710 and electrolyte which can be a conductive polymer – See paragraph 0261 and 0119-0122) disposed on a conductive substrate (700), a third electrode (800), which is also the first recombination material in claim 140, disposed between the first and second photoactive layers. In other words, the second photoactive layer is disposed in at least partial electrical contact with the

second electrode and in at least partial electrical contact with the third electrode, or the first recombination material (or electrode 800).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Salafsky by including a second photoactive and a third electrode (or a first recombination material) as taught by Ono, because it would provide a device that can response to different types of light. (See paragraphs 0012 or 0216).

It would certainly have been obvious to one skilled in the art that in the combination of Salafsky and Ono the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode.

8. Claim 114 and 120 rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. (US Patent 6946597) in view of Alivisatos et al. (PGPub 20030226498).

Sager et al. teaches a photovoltaic device as described in claim 104.

Sager et al. do not specifically teaches the nanostructures comprise nanowires.

With respect to claim 114, Alivisatos et al. teach nanostructures comprises nanorods of any length, or nanowires. (See paragraph 0061).

With respect to claim 120, Alivisatos et al. also teach the nanostructures comprise branched nanocrystal having more than one elongated segment. (See paragraphs 0061-0064)

It would have been obvious to one skilled in the art at the time the invention was made to modify the device of Salafsky by using nanostructures as taught by Alivisatos et al., because it would improve efficiency. (See paragraph 0073)

9. Claims 130-133 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. (US Patent 6946597)

Sager et al. disclose a photovoltaic device as described in claim 104.

Sager et al. do not specifically teach the overall device comprises a non-architecture, a convex architecture, a coiled architecture. However, Sager et al. teach the device is subjected to a roll-to-roll process (See col. 7 lines 26-32). Therefore it would have been obvious to one skilled in the art at the time the invention was made that the device of Sager et al. is flexible enough to have a non-planar architecture, a convex architecture, and a coiled architecture.

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to have the first electrode, the photoactive layer and the second electrode layer oriented in a reciprocating stacked architecture, because there is

nothing unobvious about rearranging the photovoltaic device to receive light from the sides, or left and right instead from the top.

10. Claims 134-136 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. (US Patent 6946597) in view of Simmons (US Patent 5720827).

Sager et al. disclose a photovoltaic device as described in claim 104.

Sager et al. do not teach the first population of the nanostructures comprising at least two different nanocrystal subpoulations, wherein each nanocrystal subpopulation has different absorption spectrum, different composition and different size distribution.

With respect to claims 134 and 136, as seen in Figure 2, Simmons teaches a nanostructure population (or photoactive region 20) comprises at least two different nanocrystal subpopulations (22, 26, 28, 30, 32), wherein the subpopulations have different size and each subpopulation has different absorption spectrum. (See col. 5 lines 45-65 and col. 7 line 35 to col. 8 line 15).

With respect to claim 135, as seen in Figure 5, Simmons teaches a nanostructure population (or photoactive region 20) comprises at least two different nanocrystal subpopulation (2aA and 20B), wherein each subpopulation comprises different compositions, or different material. (See col. 13 lines 13-50).

It would have been obvious to one skilled in the art at the time the invention was made to modify the device of Sager et al. by including at least two different nanocrystal

subpopulations with different size, composition and absorption spectrums as taught by Simmons, because it would give a photoactive layer that can efficiently absorb the entire range of incident optical radiation. (See col. 8 lines 14-16).

11. Claims 137-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. (US Patent 6946597) in view of Salafsky (US Patent 6239355).

Sager et al. disclose a photovoltaic device as described in claim 104.

Sager et al. do not teach a second photoactive layer, a third electrode, a fourth electrode, wherein the second photoactive disposed between the third and fourth electrode.

Salafsky teaches a second photoactive layer (308), a third electrode (306 and 307), a fourth electrode (310 and 312) as seen in Figure 3, wherein the second photoactive layer (308) is disposed in at least partial electrical contact with the third electrode (306 and 307) along a third plane and in at least partial electrical contact with the fourth electrode (310 and 312) along a fourth plane. The second photoactive layer comprises a second population of nanostructures having a different absorption spectrum from the first population of nanostructures (See col. 5 line 57 to col. 6 line 4), and wherein the third and fourth electrodes and the second photoactive layer are attached to the first and second electrodes and the first photoactive layer via an isolation layer 304. (See col. 5 line 26 to col. 6 line 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic device of Sager et al. by including a third electrode, a fourth electrode and a second photoactive layer as taught by Salafsky because it would provide a device that is responsive to light in more than one spectral band. (See col. 2 lines 54-60)

12. Claims 139-140 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sager et al. (US Patent 6946597) in view of Ono (PGPub 20030013008).

Sager et al. discloses a photovoltaic device as described in claim 104.

Sager et al. does not specifically teach a third electrode layer and a second photoactive layer disposed between the second and third electrodes layers, wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode. Nor does he teach a second photoactive layer, and a first recombination material disposed between the first and second photoactive layers, wherein the first recombination material is in at least partial electrical contact with the first and second photoactive layers.

As seen in Figure 21(d), Ono describes a composite light-receiving device comprising a first and second photoactive layers (710 and electrolyte which can be a conductive polymer – See paragraph 0261 and 0119-0122) disposed on a conductive substrate (700), a third electrode (800), which is also the first recombination material in claim 140, disposed between the first and second photoactive layers. In other words,

the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode, or the first recombination material (or electrode 800).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Sager et al. by including a second photoactive and a third electrode (or a first recombination material) as taught by Ono, because it would provide a device that can response to different types of light. (See paragraphs 0012 or 0216).

It would certainly have been obvious to one skilled in the art that in the combination of Sager et al. and Ono the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 104-140 are rejected on the ground of nonstatutory double patenting over claims 1-83 of U. S. Patent No. 6878871 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

The subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the application are claiming common subject matter, as follows: the photovoltaic device in claims of said Patent has the instant photoactive layer that comprises a population of nanostructure and a conductive polymer.

Furthermore, there is no apparent reason why applicant was prevented from presenting claims corresponding to those of the instant application during prosecution of the application which matured into a patent. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

14. Claims 104-140 are rejected on the ground of nonstatutory double patenting over claims 1-24 of U. S. Patent No. 7087832 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

The subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the application are claiming common subject matter, as follows: the photovoltaic device in claims of said Patent has the instant photoactive layer that comprises a population of nanostructure and a conductive polymer.

Furthermore, there is no apparent reason why applicant was prevented from presenting claims corresponding to those of the instant application during prosecution of the application which matured into a patent. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

15. Claims 104-140 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-29 of copending Application No. 11/271484. Although the conflicting claims are not identical, they are not patentably distinct from each other because the photovoltaic device in the claims of said copending application has the instant photoactive layer that comprises a population of nanostructures and a conductive polymer.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
10/22/2007

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